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Energy and wood in the French Alps: strategies for an uncertain resource

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Energy and wood in the French Alps: strategies for an uncertain resource

Hélène Avocat*, Antoine Tabourdeau*, Christophe Chauvin et Marie-Hélène De Sede Marceau

NOTE DE L'ÉDITEUR

*Both authors contributed equally to the work.

1 The hybrid notion of fuelwood encompasses diverse uses of wood for energy provision. Wood or fuel? Between the initial woody material and its final use for energy, a great diversity of forms has been developed: logs, chips, pellets, gas through torrefaction, and soon liquid through cracking at high temperature in thermochemistry. So the wood, although historically the first energy source used by Man, now stands in the category "new energies", under the spotlights of political, media and scientific actuality.

2 The domain of energy has not been investigated much by geographers, but has long been identified as a fundamental key for the territory understanding (Mérenne-Schoumaker, 2007). After geopolitical viewpoints, pointing out domination strategies, more local approaches have dealt with the circuits of energy inside the territories, we could say with their metabolism.

3 The forest, traditionally considered a national stake under the responsibility of the state, is now more considered at local scales, in a scope of multifunctionality. Fuelwood, a traditional interface between the village and the forest, through organized rights of use ("affouage"), has always been situated at the junction between the two scales of geostrategy and local development.

4 This global-local dialectic, between economic power and quality of life, is translated for the alpine territories into a dilemma between their wish to valorize an energetic resource, and to preserve their forests, as a multifunctional and vulnerable heritage.

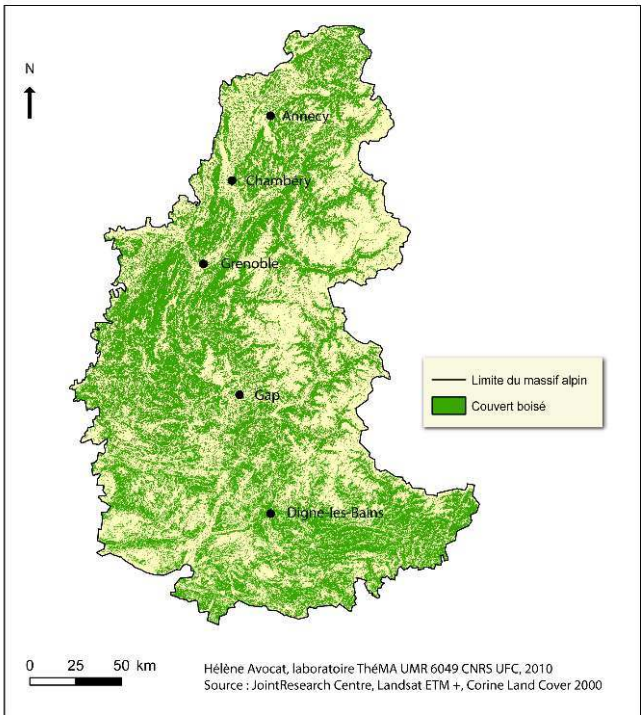
5 Then, what are the conditions for the emergence of equilibrium? We will first study the contrasting orientations given to the fuelwood chain, and the resulting tensions. We will then investigate the conditions of a balanced development of fuelwood, and examine the benefits which this development is susceptible to bring, in terms of climate change as well of satisfaction of diverse energetic demands.

The fuelwood sector in the French Alps

A priority in the alpine environmental and forestry planning

6 With a forest area over 1.7 millions hectares (map 1), i.e. a cover rate of 41%, the alpine territory is an important source of woody biomass, but its accessibility is highly variable.

Map : Forest cover in the French Alps



7 According to the *Comité du massif des Alpes* set up by the French national planning agency (DATAR, the *Délégation interministérielle à l'aménagement du territoire et à l'attractivité* régionale), sustainable planning and forest harvesting will have become important issues by the year 2020, and the energetic valorization will be part of the alpine forest strategy. This strategy particularly depends on the 2007-2013 interregional policy program. Several planning tools such as the *Schéma stratégique forestier du massif des Alpes*[1] and the "Inter-regional Convention for the Alpine Massif" (CIMA), and the "Inter-regional Operational Program of the Alpine Massif" (POIA)[2] clearly aim at the rise in fuelwood utilisation in the Alps, but only if it meets mountain forest's specificities and their vulnerability. These planning tools are completed at the local scale by complementary plans called *Chartes forestières de territoire* (CFT) aiming to implement and adapt national

forest policies to local constraints and opportunities. More than 30 CFT covers 40% of the French Alps and are clearly meant to reach local wood energy utilization goals.

A development based on demand increase

8 Although timber wood production is the most important aspect of French and alpine forest policies, fuelwood production is highly encouraged (Bianco, 1998; Réseau alpin de la forêt de montagne). However, nothing is obligatory: the texts published by French government only advocate general goals to reach. The *Grenelle de l'environnement* recommends ambitious goals for fuelwood by the year 2020 with an increase of more than 6,200 kilo tons oil equivalent for industrial and collective sector.

9 Actually, policies concerned by fuelwood consumption (demand) are more efficient than plans which promote wood exploitation (offer). Their financial support is also more important. Institutions such as the *ADEME*[3] or the *CRE*[4], aims to create new projects in industrial and collective sectors, using a top-down approach (Poupeau and Schlosser, 2010). On national scale, calls for tender from *the CRE*, the *Plans bois-énergie et développement local* (literally Fuelwood and local development Plans, PBEDL) created in 1994, and the Heating Fund (*Fonds Chaleur*[5]) also hold by l'ADEME, plan to create important stations of cogeneration (more than 1 MW). At the same time, the ADEME and the *Fédération nationale des communes forestières*[6] (FNCOFOR) decided to support smaller projects. This program called "1000 wood boilers for rural areas" aims to provide the creation of small boilers functioning together, on local scale, from 2007 to 2012. The ADEME along with the regional and general councils play a new role: promoting a sustainable development of the fuelwood sector based on small boilers, and utilization of forest and agricultural resources.

A two-tier logic implying a very differentiated consumption pattern

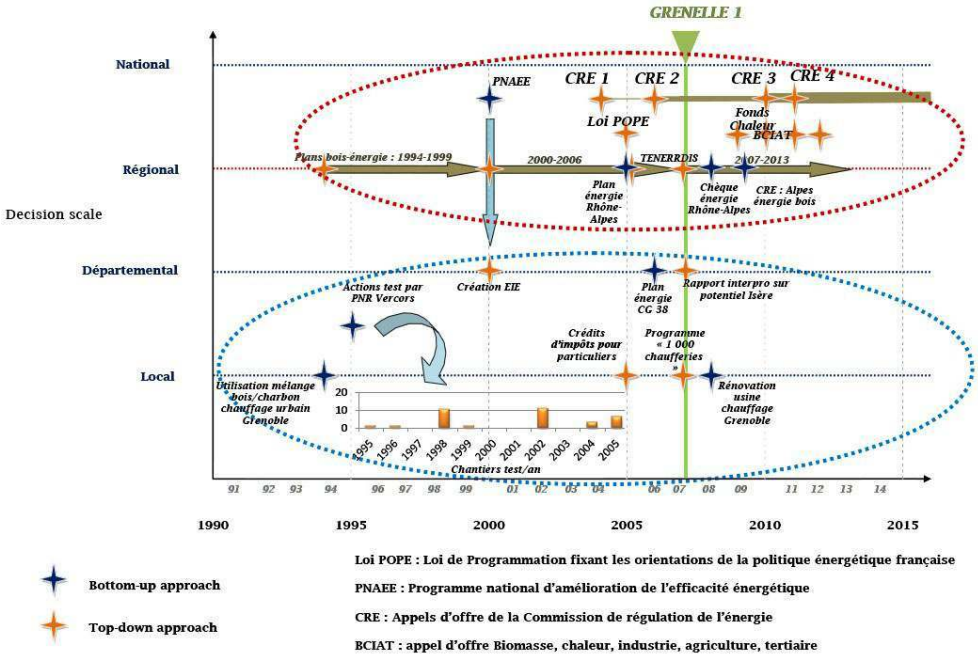
10 Nowadays, different decision and incentive scales can be set out. Based upon the concrete example of the French Isère administrative region (*département*), figure 1 illustrates their changes. First, in the 1990s, most of the attempts to bring fuelwood out took place at a very local scale, e.g. the introduction of a mix between coal and wood by the company in charge of the district heating system in Grenoble area, or chip tests on lumber sites by the Vercors Regional Nature Park. In December 2000, with the creation of associations like the *Espaces Info-Énergies* (EIE) to promote and lead the development of renewable energy, including fuelwood, coordinated by the ADEME, the *Programme national d'amélioration de l'efficacité énergétique* (PNAEE), whose aim is to enhance energy efficiency, symbolized governmental recognition of the knowledge and level of expertise acquired in twenty years by local associations.

11 Consequently, the EIE are partially in charge of the local public action. A task which could have been State's duty is purposely left to a private organization, as Jeannot shows in his book (2005).

12 Then, starting with the PBEDL, different measures have been introduced in order to foster large heating systems instead of small ones, and to raise the bid on the resource, as it already had been done during the 1980s for the paper-making industry. Among these measures it is worthy to mention the bids made by the CRE or the 1.2 billion of euros rose by the Heating Fund. The latter, managed by the ADEME, was a consequence of the 2007

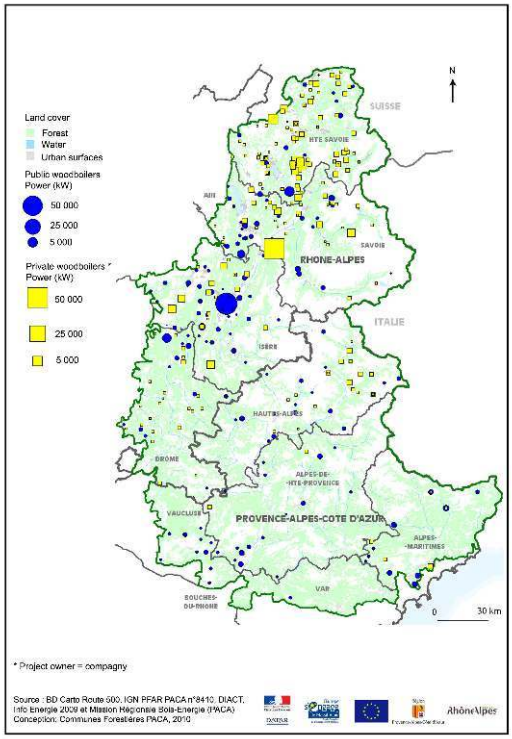
Grenelle de l'environnement[7], and provides the *Biomasse, chaleur, industrie et agriculture*[8] (BCIA then BCIAT since 2010) bids for heating systems bigger than 1,200 MWh per year.

Figure : decision scales and incentives to foster wood-based heating systems. Blue and red circles mark off local (blue) and national (red) approaches.



13 These scales contribute to the setting up of a two-tier logic: on the one hand, promotion of big projects, considered as drivers for the system, and on the other hand, fostering medium and small heating systems. The result is a certain heterogeneity in the whole of the French Alps, with large heating systems considered as formatives (heating systems of the sawmill Bois du Dauphiné, in the Grésivaudan valley, or the district heating system in Grenoble), facing a majority of smaller heating systems (map 2). Therefore, the important question whether two different logics are really applied or whether complementarities should be sought with specific tools for each scale. No apparent gap distinguishes the so-called driving projects to other ones; each one could be, at its own scale, a driver for both sector and territory. However, developing large-scale projects can be considered as an (illusory?) approach to improve administrative and energetic efficiency.

Map : Heating systems in the French Alps

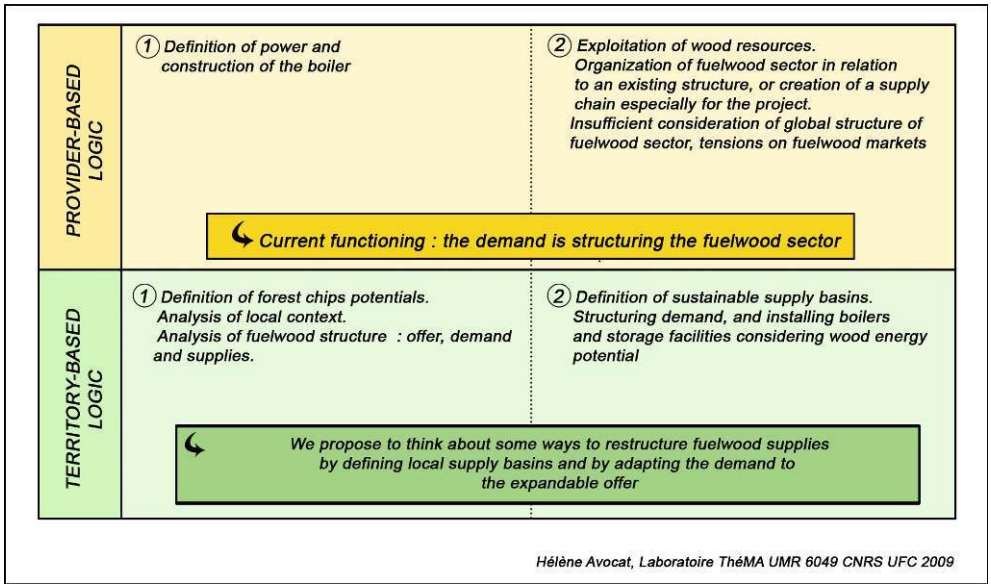


14 This heterogeneous consumption pattern gets more complex when looking at the three types of supply chains: industrial, public, and person directed chains (Amblard and Taverne, 2010), whose operational systems are very different from one another. They follow two opposed logics:

- a “sector logic”, guaranteed by professionals, marked by firms specialized in chips that tend to grouping in order to provide large volumes to the most important heating systems (consuming more than 1 MW);
- a “territorial logic” guaranteed by local authorities getting involved in forest development on their own territory. This latter configuration is more able to satisfy small heating systems with short supply chain needs. Nonetheless, it is more difficult to implement the territorial logic since it needs to take into account both the offer and the heterogeneous consumption pattern on a given territorial scale.

15 Nowadays, the sector logic has the upper hand, with a demand and project-based pattern. This logic clearly focuses on the providers belonging to the supply chains (figure 2).

Figure : Territory-based logic versus provider-based logic



16 However, "who, better than a territory, has the ability to assess its own resources and to implement the relevant local energy policy, and therefore sustainable because fitted to every context? Who, better than a territory, can benefit from shortages of fossil fuels to develop local energies and the subsequent added value, and to implement "territorial intelligence"? (ARENE, 2008). Thus, the integration of local specificities and potentials is lacking. Such an approach would be more suitable in the perspective of a balanced, enduring long-term development, especially in mountain areas where issues regarding forest harvesting are very sensitive.

New issues for the alpine forest

17 Due to an increasing demand for fuelwood (AFOCEL, 2006; Helderlé, 2006), woodland in alpine areas suffers today from increased pressures. Chips directly made in forest (which are to be differentiated from sawmill by-products) appear to be a territorial resource seen to be a forthcoming development.

Forest chips, a territorial resource called to a further development

18 First considered as too technical, the use of the forest chip has gradually increased. In 2009, 85,000 tons have been used in the Rhône-Alpes *région* and the ADEME foresees a 120,000 tons' demand by the end of 2011, without including big industrial heating systems.

An outlet for the forest

19 Made either from broadleaf and coppice accretions, or from residues of thinning and lumber operations, forest chips are an interesting increase in value for by-products which would not necessarily have other outlets. "They allow enhancing the value of an important part of coppices and wood debris, currently underexploited because of the

concurrence from other kinds of chips (sawmill and industry by-products), the lack of sector structuring and the resource availability" according to the *Direction régionale de l'alimentation, de l'agriculture et de la forêt*[9] (DRAAF) in a public document summing up the main objectives to develop fuelwood sector in Rhône-Alpes *région*. With a forest considered as underexploited in an ailing sector (Puech, 2009), the recovering of wood debris carries top issues for territorial and forest planning and constitutes "a new deal for the historic forest sector stakeholders" (Poupeau and Schlosser, 2010).

A forthcoming increased demand in forest chips

20 The development of fuelwood was initially based on industrial by-products which did not have any other outlets. Now, forest chips are more and more needed to face the increasing demand (*ibid.*). In 2006, the AFOCEL stated that "the weak growth of the processing sector does not allow the consideration that the sawmill by-products could appreciably grow in the forthcoming years". Consequently, "the forest constitutes the pool which, in a short forecast, has the volumes which could satisfy the growing industrial demand." Helderlé (2006) affirms this acknowledgement by claiming that "the late development of public and industrial heating systems created a new demand inside the forest sector, with the perspective to satisfy energy needs. Given the multiplication of big heating systems, either already in work or in project, energy recovering from other pools to produce forest chips, notably with secondary qualities wood with no industrial outlets, is now imperative otherwise the stability of the wood sector would be severely compromised". In March 2010, according to the ADEME, about two-third of the 61 registered fuelwood providers supplied forest chips. Nevertheless, the mobilization should match the available resources and should not exceed them, and has to include the specific multifunctional role of the alpine forest.

The alpine forest, between protection and increased production requirements

21 For most of the people, a high forest cover means an important fuelwood potential. Indeed, with a 42% forest cover, the French Alps could look like an inexhaustible chip pool. In a context of both increasing fuelwood demand (Courbaud, *et al.*, 2011; Millienium Ecosystem Assessment, 2005) and the will to preserve ecosystem functions, the forest seems to be more than ever an "ambivalent space, between economic resource to develop and natural patrimony to protect" (Galochet, 2006). In an uneven environment, forest plays an important role in protecting people and infrastructures from different gravity-related hazards such as rockfalls and avalanches. The ecosystem and recreational functions are to be taken into account and integrated with an increased wood mobilization: "Alpine territorial systems are currently characterised by an ever-increasing tension between economic development imperatives on the one hand, and the need to preserve an exceptional natural heritage that is particularly sensitive to global change on the other" (Brun, 2008). Thus, for some forest smallholders, exploitation usually means degradation of forests and soils, especially in the case of fuelwood with woody debris to be removed[10]. If woody debris are systematically taken, it deprives soils from a necessary regeneration input. Surveys assessed by the CRPF in Rhône-Alpes confirmed this conservatory approach towards the forest, whereas for the forest sector

stakeholders, a reasoned silviculture allows stimulating forest growth and reducing their natural mortality.

Some important constraints of exploitation

22 In order to meet the demand in forest chips, we have to increase exploitation of forest resource. Some behavioral reluctances are added to technical and economic difficulties: the topography infers another obstacles, which have repercussions on the price of the forest chips. The number of forest holders using cable skidding has decreased, whereas 62% of Rhône-Alpes forest area is considered as "difficult or very difficult to exploit" (IFN and CRPF, 2007), and the two-thirds of additional biomass to exploit is located in slope sectors.

23 Moreover, forest chips producers encounter constraints dues to forest division. The drop-off area of woody parcels observed in the 20th century is a major difficulty for forest exploitation, and hindrance to fuelwood development. It is the reason why professionnals of forest sector insist on the necessity to coordinate forest owners. In a context of climate change and energetic crisis, it seems essential to think about capacities for adaptation of mountain forests, in order to ensure a sustainable development of fuelwood sector.

Fuelwood and adaptation of alpine territories

Fuelwood: from dream to reality…

24 Fuelwood proponents have several arguments. In spite of their vulnerability, the Alps have a "a great potential to be revealed or (re)valorised [notably thanks to] their natural environment" (Corrado, 2010). Fuelwood is one of these resources which can be exploited in a strategy of local development. Moreover, climate change could have repercussions on forest repartition and productivity (Courbaud et al., 2010), which could be beneficial to the fuelwood sector. This increase of productivity could secure fuelwood supplies.

25 But one of the most important factors to improve biomass mobilization is implication of forest actors. Some Austrian examples, mainly in the Vorarlberg (Madlener, 2007), have shown the importance of strong actors at every levels of decision, especially in a logic of local development. In France, the FNCOFOR is one of the most important actors in the fields of planning and innovation, involved in the support for fuelwood sector with institutions like CIMA, POIA, and the DATAR. The FNCOFOR support the program "*1000 wood boilers for rural areas*", whose main purpose is promotion of local resources. In this context, the FNCOFOR has developed a decision-making support tool to model the resource availability, the "*Plans d'Approvisionnement Territoriaux*", which arouse the interest of several actors.

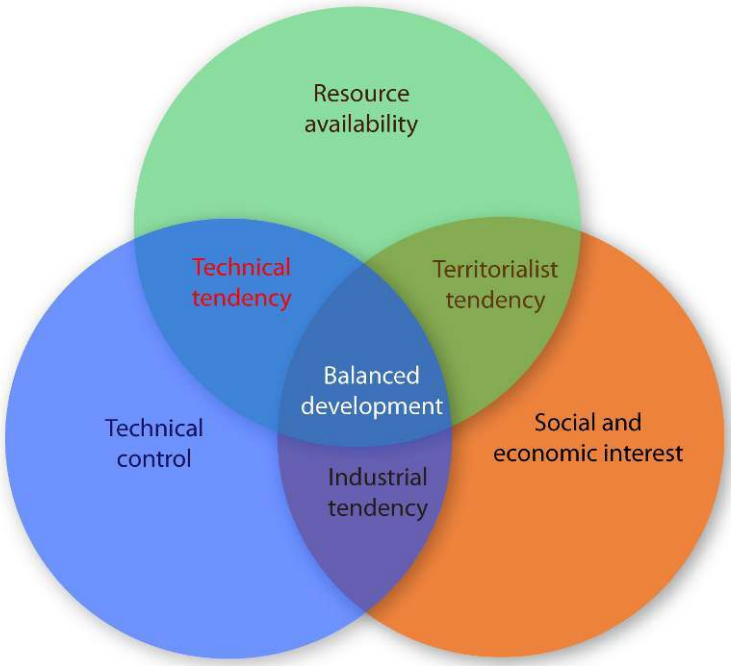
Conditions for an harmonious development of the fuelwood sector in mountain areas

26 Thus some development perspectives are marked out, their fulfillment faces heavy constraints. From the issues identified above, three conditions necessary to a sustainable fuelwood sector can be outlined:

- availability of the wood resource (industrial or sawmill by-products, forest chips);
- development of technical and scientific approaches and tools suited to a sustainable use (i.e. making of heating systems, modeling knowledge for the location of resource and supply chains, etc.);
- social and economic interest (development and revitalization of declining territories, increased wood production, energy independence).

27 In the Alps, controlling each of these aspects is delicate. Three main unbalanced situations, matching each the lack of one condition, have been identified, as figure 3 shows.

Figure : The three conditions to a sustainable fuelwood sector



Antoine Tabourdeau, PACTE/Cemagref, 2011

28 The first imbalance can be seen as a "territorialist tendency". It is defined by arguments where the terms "territory" and "local" are used as the absolute justification to every intervention or reasoning, but with no clear definition of both terms. The increasing number of labeled products (Bois des Alpes, Bois d'ici, AOC Chartreuse, etc.) underlines this tendency.

29 Then, the 'industrial tendency" is the preponderance of a top-down approach (i.e. as described in figure 2) including only technical and scientific ways and social and economic interest, but not resource availability issues.

30 Unlike this second tendency, the "technical tendency" mainly focuses on these resource availability issues and the good use of this resource, especially the impacts of outputs on ecosystems, favoring a sector approach to a territorial one.

31 Different experiences like in *Pays de la Vésubie* (with pastoral management combined to use of wood debris) showed a remarkable example of resilience and adaptability (Union régionale des associations de communes forestières, 2006) and allow:

- facing the increasing demand in forest chips;
- enhancing pastoral activities already existing by removing wood debris impeding the cattle to reach grass;
- maintaining landscape and the tourist attractiveness.

32 This kind of experience outlines perfectly the relevance of a true territorial approach intersecting energy, environmental, social and economic, landscape and even cultural concerns. Finally, fuelwood exploitation has to be integrated into a complex territorial system with specific local configurations. Thus, there is no "miracle" solution that could be prescripted everywhere.

33 Now, the fuelwood sector is lacking structuring. The issue of scales is definitely meaningful, particularly in the Alps, where there are more crossed stakes than everywhere else, making mobilization of wood more complex. This situation requires political arbitrations, with a sufficient knowledge of local issues or, at least, enough latitude to local adaptation. On this account, cartography of the resource means more than a simple technical tool, its use depending upon the choice of a specific territorial approach. The works lead by Hélène Avocat (UMR ThéMA) in modelling local supplying pools and cartography of the biomass potentially available for fuelwood, based upon a coupling between satellite image, dendrometric data and yield tables, falls into the framework of decision-making support and territorial structuring. A revealing example of this is the choice made by the FNCOFOR to encourage rural areas, in contrast to the top-down approach privileged by the CRE bids. Actually, it contributes to the elaborate new visions of space and resource which are the starting point to develop strategies and relationships between stakeholders. Without an accurate knowledge of the availability of the resource, developing storage points is an impossible challenge, as difficulties in Trièves and Vercors (both South of Grenoble) areas attest it. The know-how with regard to resource modeling is a prerequisite to set up an efficient road network, allowing traditional techniques like extraction and reuse of cable logging old techniques. New forest harvesting modes are studied, in particular by the ONF, already in use in other countries (Austria, Switzerland and Italy), among them opening in a stand system in steep slopes.

34 Today, the wood is exploited at different scales, functions of boiler's power. Such a functioning could generate competitions between public, private and industrial boilers and reveals an inappropriate strategy. Approaches based on operators show their limits. An organization of the fuelwood sector focused on territory would improve our knowledge about wood energy potential, spatial concurrence (overlap of supply basins), conflicts about different uses of wood (energy, timber wood, pummeling...), and would help to have an integrated vision of the fuelwood sector.

Conclusion

35 The development of fuelwood in the Alps refers to the way resources may be appropriated in a highly heterogeneous area. The economical and logistic construction of the wood chain has to deal with a constraining geographic frame, including the difficulties to access the resource, the multifunctionality of the mountain forests, the fragility of the ecosystems – the whole needing a transversal strategy.

36 Moreover, the diverse animation processes launched by the forest actors on the one hand, and by the energy actors on the other hand, have made clear the need for a common language between the different worlds committed. Such a common language will have to be built at different organization levels, between actors having to confront their strategies at their specific scales. This requirement will need the development of geographical approaches of the fuelwood chain, considering both supply and demand at the scale of a given territory, and taking in account the different strategies developed by the stakeholders along the chain. Considering the intrinsic complexity of the resource and of its valorization system is necessary to allow the collective construction of an integrated energetic policy, for an optimized sober use of energy.

37 Then, beyond the mobilization of technical disposals to improve the qualification of the resource, and to enhance economic, energetic or environmental efficiency along the wood chain, a territorial reference is requested. Identifying and understanding its structure and its dynamics are conditions for the forest resource sustainability and then for the sustainability of the services it provides, and finally for a sustainable territorial development.

38 Presently some fuzziness about fuelwood in the words, the figures and the scales allow the maintenance of some illusions, which will quickly be confronted to reality. Yes indeed, the wood resource remains limited compared with our needs or at least uses, yes indeed its access is difficult and expensive, yes indeed an unkind exploitation degrades the forest, yes indeed misuses of fuelwood pollute the atmosphere. Denying these realities will surely lead to breakdowns, but taking them in account could block any launch, except if this taking-in-account of these constraints is collective, cross-scales with diverse kinds of transfers. The examples from neighboring countries, hardly transposable even locally, suggest it strongly: fuelwood actions in mountain depend on a set of conditions, in specific environmental, economic and political contexts, with highly implied stakeholders.

39 The wood resource is sufficiently rare, precious and potentially harmful not to be spilled, and to be treated with the most elaborated technologies. Fuelwood in mountain then could be both a way towards an authentic green economy, and a reminder of the dangers of not respecting soberness, solidarity and environmental kindness. Henceforth, efforts have to concentrate on territorial intelligence to improve our understanding, still imperfect, of these complex issues then to collectively build a referential of sustainable development in the Alps.

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NOTES

1. i.e. the Alpine Massif Forest Strategic Scheme
2. CIMA and POIA are both regional planning programs set up by the DATAR at the specific alpine scale.
3. French governmental agency for environment and energy
4. The *Commission de régulation de l'énergie* is an administrative instance existing since 2000, whose charge is to regulate energy sector in France.
5. The *Fonds chaleur* contributes to the European Union's climate change package by fostering heating production based on renewable energies.
6. The FNCOFOR gathers 5000 forested municipalities in France.
7. The *Grenelle de l'environnement* is a French major environmental meeting between State, local authorities, associations, NGOs, workers and employers, which concluded by a body of laws to improve environmental issues.
8. I.e. "Biomass, Heating, Industry and Agriculture" bids
9. The *DRAAF* is the public authority in charge of food, agriculture and forest issues at the regional level.
10. Woody debris are branches and by-products remaining on the ground after harvesting. It is a secondary quality wood with no industrial outlet. Therefore, they are an important fuelwood pool. Thinning diameter is inferior to 7 cm, otherwise they are considered as timber wood.

RÉSUMÉS

During the last decade, fuelwood has developed in the alpine territories under voluntarist policies. Facing a next shortage of sawmill by-products, widely used for paper, chipboards and pellets, forest chips are bound to develop for industrial or local use. This is an opportunity for the alpine forests and territories, of which, nevertheless, vulnerability must be taken in account. Studying policies and instruments shows very contrasted approaches, which could generate tensions on the resource, and behaviors in possible contradiction with de development of a true green energy, such as: increase of transport lengths and then of pollutants emissions, degradation of the environment, and loss of the multifunctionality of the forests.

INDEX

Keywords : alpine forest, energy policy, fuelwood, supply chains, territory

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